



## 1a. REPORT SECURITY CLASSIFICATION

Unclassified

## 2a. SECURITY CLASSIFICATION AUTHORITY

N/A

## 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

N/A

## 4. PERFORMING ORGANIZATION REPORT NUMBER(S)

DOD POP HMTR/AYD 93-022

## 6a. NAME OF PERFORMING ORGANIZATION

Packaging Division, AED

6b. OFFICE SYMBOL  
(If applicable)

SMCAR-AEP

## 6c. ADDRESS (City, State, and ZIP Code)

US Army Armament Research, Development and  
Engineering Center  
Picatinny Arsenal, NJ 07806-50008a. NAME OF FUNDING/SPONSORING  
ORGANIZATION

Packaging Division, AED

8b. OFFICE SYMBOL  
(If applicable)

SMCAR-AEP

## 8c. ADDRESS (City, State, and ZIP Code)

US Army Armament Research, Development and  
Engineering Center  
Picatinny Arsenal, NJ 07806-5000

## 1b. RESTRICTIVE MARKINGS

None

## 3. DISTRIBUTION/AVAILABILITY OF REPORT

Distribution A: Unlimited

## 5. MONITORING ORGANIZATION REPORT NUMBER(S)

## 7a. NAME OF MONITORING ORGANIZATION

None

## 7b. ADDRESS (City, State, and ZIP Code)

None

## 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

## 10. SOURCE OF FUNDING NUMBERS

PROGRAM  
ELEMENT NO.PROJECT  
NO.TASK  
NO.WORK UNIT  
ACCESSION NO.

## 11. TITLE (Include Security Classification)

Performance Oriented Packaging (POP) Testing of Expulsion Charge Assembly for M509A1, 8 inch  
Projectile, packed one hundred (100) per wood box.

## 12. PERSONAL AUTHOR(S)

Raymond J. Siroy

## 13a. TYPE OF REPORT

Final

## 13b. TIME COVERED

FROM \_\_\_\_\_ TO \_\_\_\_\_

## 14. DATE OF REPORT (Year, Month, Day)

94-05-04

## 15. PAGE COUNT

## 16. SUPPLEMENTARY NOTATION

## 17. COSATI CODES

FIELD	GROUP	SUB-GROUP

## 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

1. Performance Oriented Packaging
2. Ammunition Packaging
3. Wood Box
4. Packaging

## 19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This Performance Oriented Packaging (POP) report is for the Expulsion Charge Assembly for the M509A1, 8 Inch Projectile, packed one hundred (100) per wood box in accordance with drawing 12598434. This report describes the results of testing conducted with Inert Expulsion Charge.

## 20. DISTRIBUTION/AVAILABILITY OF ABSTRACT

☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS

## 21. ABSTRACT SECURITY CLASSIFICATION

## 22a. NAME OF RESPONSIBLE INDIVIDUAL

STEVE RUFFINI

## 22b. TELEPHONE (Include Area Code)

201-724-2515

## 22c. OFFICE SYMBOL

SMCAR-AEP

I. Report Number: DOD POP HMTR/AYD 93-022

II. Title: Performance Oriented Packaging (POP) Testing of Expulsion Charge Assembly for M509A1, 8 inch Projectile, Packed One Hundred (100) per Wood Box

Drawing Number: 12598434

Author: Raymond J. Siroy

Performing Activity: U.S. Army Armament Research, Development and Engineering Center (ARDEC)

Address: Department of the Army  
Commander, U.S. Army ARDEC  
Attn: SMCAR-AEP  
Picatinny Arsenal, N.J. 07806-5000

Date: May 1994

Distribution Statement A.

Approved for public release; distribution is unlimited.

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification .....	
By .....	
Distribution /	
Availability Codes	
Dist	Avail and / or Special
A-1	

94-16260



7/96

84 5 31 119

**1. DATA SHEET:**

**a. CONTAINER (Outer Pack)**

Type: Box

UN Code: 4C1

Part Number: 12598436

Spec Number: MIL-B-2427

Material: Wood

Capacity: 3153.56 Cubic Inches (51650.70 cu. cm)

Dimensions:

Inside: 44.60 cm. x 43.18 cm x 26.82 cm  
( 17 9/16 in. x 17 in. x 10 9/16 in.)

Outside: 51.91 cm. x 46.99 cm x 32.38 cm  
( 20 7/16 in. x 18 1/2 in. x 12 3/4 in.)

Closure (Method/Type): Nailed and Strapped

Tare Weight: 10.45 kg (23 lbs)

**b. CONTAINER (Inner Pack)**

Type: Box

UN Code: 4G

Part Number: 12598435-1

Spec Number: PPP-B-636

Material: Fiberboard

Capacity: 2617.47 Cubic Inches (42879.33 cu.cm)

Dimensions:

Inside: 41.75 cm. x 41.75 cm x 24.60 cm  
( 16 7/16 in. x 16 7/16 in. x 9 11/16 in.)

Outside: 42.70 cm. x 42.70 cm x 26.19 cm  
( 16 13/16 in. x 16 13/16 in. x 10 5/16 in.)

Closure (Method/Type): Taped

Tare Weight: 1.81 Kg (4 lbs)

**c. PRODUCT**

Name: Expulsion Charge Assembly  
United Nations Proper Shipping Name: Charges, Propelling  
United Nations Number: 0491  
NSN: 1320-01-2426568  
Drawing Number: 12576776  
Physical State: Solid  
United Nations Packing Group: II  
Quantity Per Wood Box: 100 Expulsion Charges

**d. TEST MATERIALS:**

Name: Inert Expulsion Charge Assembly  
Physical State: Solid  
Size:  
Diameter = 1.480 inches max, except lid  
Length = 9.350 inches max

Quantity: 100 Inert Expulsion Charge per Wood Box  
Gross Weight: 70 pounds (31.81 kg)

**2. BACKGROUND:**

This report contains the testing and test results performed for Performance Oriented Packaging Certification of Expulsion Charge Assembly (Part Number 12576776) for the M509A1, 8 inch Projectile, Packed One Hundred (100) per Wood Box in accordance with drawing 12598434. Tests were performed in accordance with Part 178, Subpart M-Testing of Non-bulk Packaging and Packages, Title 49 of the Code of Federal Regulations (CFR).

**3. INTRODUCTION:**

The Department of Transportation (DOT) per CFR, Title 49, Parts 100-180, dated 1 Oct 92, requires that hazardous materials be packed in containers which satisfy the Performance Oriented Packaging (POP) requirements.

The Wood Box, part number 12598436, is being used as the shipping container for Expulsion Charge Assembly (Part Number 12576776) for the M509A1, 8 inch Projectile. The package contains one hundred (100) of Expulsion Charge Assemblies per wood

box in accordance with drawing 12598434. Each packed wood box has an individual estimated gross weight of 66 pounds.

POP tests were conducted using Wood Boxes, each containing inert Expulsion Charge Assemblies for a total gross weight of 70 pounds, resulting in a weight which is higher than the heaviest pack (estimated at 66 pounds) to insure wood box integrity. The tests were conducted in accordance with referenced sections of CFR, Title 49 and are valid only when approved ammunition is packed in the wood box as specified above for the Department Of Defense.

A total of five (5) packed wood boxes were POP tested in accordance with part 178, Subpart M-Testing of Non-bulk Packaging and Packages, Title 49 of the CFR.

#### **4. TESTS PERFORMED:**

##### **a. Stacking Test**

The CFR requires that the minimum height of the stack including the test sample must be 3.0 meters (10 feet). Three test samples are required. Each packed wood box has an individual gross weight of 70 pounds.

A 3.0 meter stack height of samples is equivalent to 630 pounds (286.36 kg) of stack weight. Three different test samples were each subjected to a stack weight of 630 pounds for a period of 24 hours. The samples were then inspected for any damage or distortion. The above procedures were performed in strict manner in accordance with paragraph 178.606 "Stacking Test" of the CFR.

##### **b. Vibration Test**

Three packed wood boxes, each having an individual gross weight of 70 pounds were tightly closed (nailed and strapped), as for shipment. The boxes were then placed on a vibrating platform that has a vertical double-amplitude (peak-to-peak displacement) of one inch. The three packed wood boxes were then vibrated for one hour to such a degree that a piece of steel strapping (1/16 inch thick) easily passed underneath any of the boxes at any given time throughout the test. The three boxes were horizontally prevented from falling off of the vibrating platform while being free to move vertically, bounce and rotate. Upon completion of the test, all three packed wood boxes were removed from the vibrating platform, turned on their side and observed for any evidence of breakage and leakage. The above procedures were performed in strict manner in accordance with paragraph 178.608 "Vibration Standards" of the CFR.

**c. Drop Tests**

The CFR specifies that one box should be used for each drop orientation. Each box shall be dropped from a height of 1.2 meters (3.9 feet) in the following orientations: drop flat on the bottom, drop flat on the top, drop flat on the long side, drop flat on the short side, and drop on the corner. A total of five (5) boxes are specified for the five different orientations with one box being dropped for each orientation. For this test, however, the same three packed wood boxes that were tested in paragraph 4a and 4b were used for the Drop Test. Since the number of packed wood boxes available were only three, each box was dropped twice at two different orientations (for a total of six drops), with an extra drop on the opposite corner of the box. This exceeds the requirement of one drop per box, for the total of five boxes. The above procedures were performed in strict manner in accordance with paragraph 178.603 "Drop Test" of the CFR.

**5. PASS/FAIL (DOT CRITERIA):**

- a. Stacking Test:** A test sample passes the stacking test when no test sample spills its contents. No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength or cause instability in stacks of packages.
- b. Vibration Test:** A packaging passes the vibration test if there is no rupture or spillage from any of the packages.
- c. Drop Test:** A package for explosives is considered to successfully pass the drop tests if for each sample tested, no rupture of the packing occurs.

**6. TEST RESULTS:****a. Stacking Test**

All three packed wood boxes were removed from the stacking platform after 24 hours of test. Each wood box was carefully inspected for any structural damage. All the wood boxes tested were tightly intact and showed no evidence of rupture or spillage. All packages passed the test.

**b. Vibration Test**

All three packed wood boxes were removed from the platform after one hour vibration. Each of the wood box was physically inspected for any damage or spillage. All the wood boxes tested were tightly intact and showed no evidence of deterioration. There was no spillage or any damage of the three packed wood boxes. All packages tested passed the test.

**c. Drop Test**

Upon completion of the drop tests, all three packed wood boxes tested were carefully inspected for any damage. There were no cracks in the wood, ruptures or spillage. All packages tested passed the test.

**7. CONCLUSION:**

Based upon the above successful POP testing, the following UN POP symbol has been applied to the wood box in accordance with drawing 12598434.



**4C1/Y32/S/\*\*  
USA/DOD/AYD**

**\*\* Last two digits of year packed.**